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Immediate Water Pollution Control Needs Grand (NEOSHO) River Basin: Arkansas, Kansas, Missouri, and Oklahoma

Federal Water Pollution Control Administration, Dallas, Texas

Apr 67

PB 266 395

IMMEDIATE WATER POLLUTION CONTROL NEEDS

GRAND (NEOSHO) RIVER BASIN

ARKANSAS, KANSAS, MISSOURI, AND OKLAHOMA

UNITED STATES
DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTH CENTRAL REGION
DALLAS, TEXAS 75202

APRIL 1967

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16. ABSTRACT

The purpose of the report is to focus attention on known sources of water pollution in this area and to provide a priority for action to correct existing problems and to prevent future problems.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
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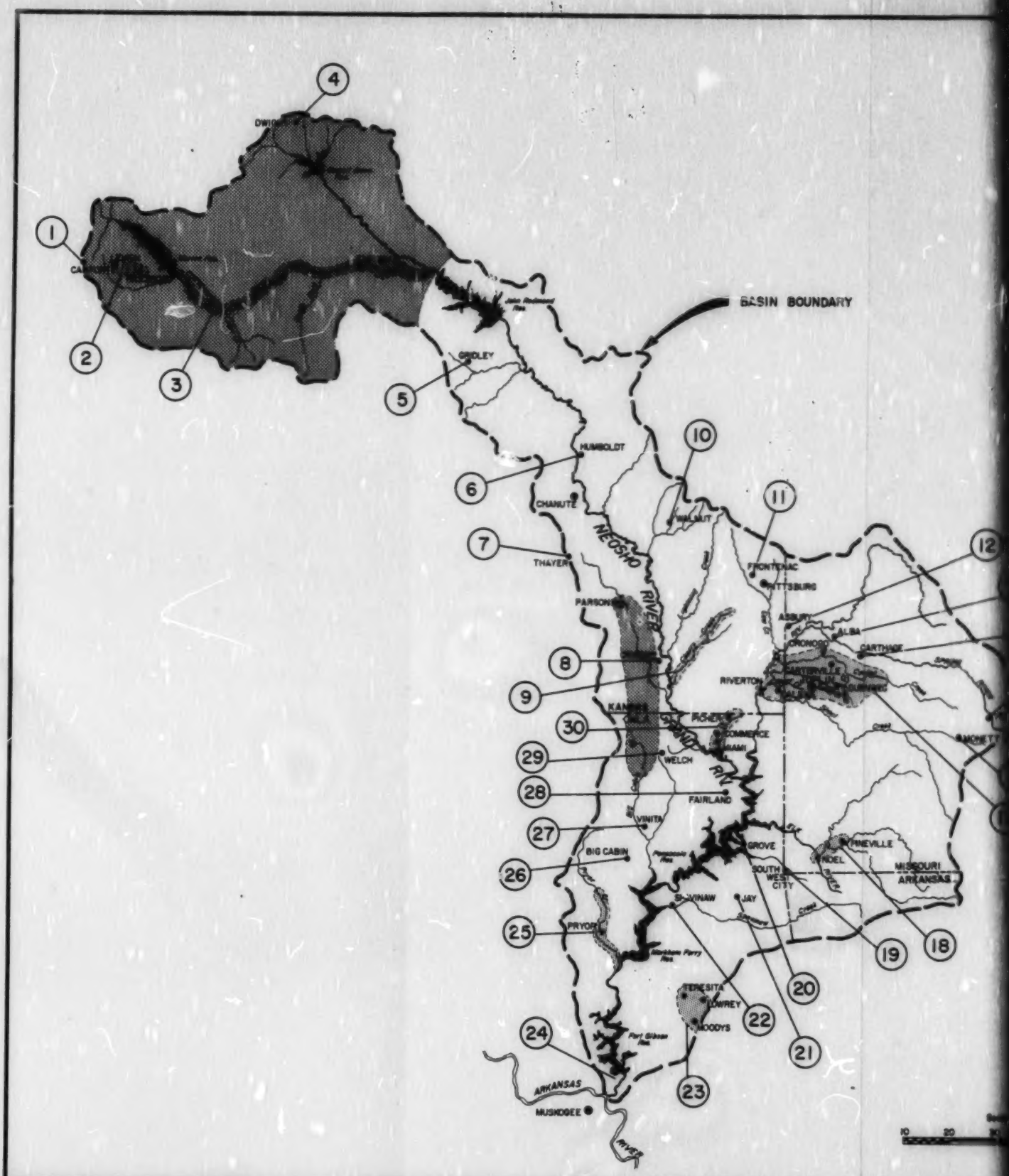
I. Introduction

The purpose of this report is to focus attention on known sources of pollution and to provide a priority for action to correct the existing water pollution problems and prevent future problems in the Grand (Neosho) River, (see Figure 1), an interstate stream and its tributaries. This report is based on compilations of available data of the Federal Water Poilution Control Administration, South Central Region, and the pollution control agencies of Arkansas, Kansas, Oklahoma, and Missouri. No detailed water quality surveys or engineering studies were carried out for the preparation of this report.

The findings of this report are based on the best information available at this time on water quality conditions and immediate and potential pollution abatement needs. The omission of any particular town, industry, or other establishment from this report does not imply that an immediate or potential pollution abatement need may not possibly exist in that particular area. Priorities listed are based solely on an evaluation of the Grand (Neosho) River Basin and not on a relative basis with other basins in the South Central Region.

Authority is given in Section 3(a) of the Federal Water Pollution Control Act, as amended, for the preparation or development of comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof and improving the sanitary conditions of surface and underground waters. This report, by describing the immediate needs for controlling water pollution in the Grand (Neosho) River Basin, represents the first step in the development of a comprehensive program to control water pollution in this basin.


BASIN BOUNDARY
NEOSHO RIVER
ARKANSAS RIVER
HUMBOLDT
CHANUTE
THAYER
PARSONS
FRONTENAC
PITTSBURG
ASHERY
ALBA
CROWDER
CARTHAGE
RIVERTON
KANSAS
COMMERCE
MIAMI
WELCH
FAIRLAND
VINITA
BIG CABIN
GROVE
SOUTH WEST CITY
MISSOURI
ARKANSAS
PRYOR
SHAWNAW
JAY
TERESITA
LOWREY
MOODYS
MUSKOGEE
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VICINITY MAP

BASIN BOUNDARY

LEGEND

(2) NEEDS

CATTLE FEEDLOTS – Area of concentration

Scale in Miles
10 20 30 40 50 60

IMMEDIATE WATER POLLUTION CONTROL NEEDS
GRAND (NEOSHO) RIVER BASIN
KANSAS, OKLAHOMA, MISSOURI AND ARKANSAS

LOCATION MAP

UNITED STATES DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
SOUTH CENTRAL REGION APR. 1967 DALLAS, TEXAS

FIGURE 1

BASIN BOUNDARY
GRIDLEY
HUMBOLDT
CHANUTE
THAYER
NEOSHO RIVER
PARSONS
WALNUT
FRONTENAC
PITTSBURG
ASHLEY
ALBA
CRONOGO
CARTHAGE
CARTERVILLE
JOPLIN
RIVERTON
PICHER
COMMERCE
MIAMI
WELCH
FAIRLAND
VINITA
BIG CABIN
GROVE
PINEVILLE
NOEL
SOUTH WEST CITY
MISSOURI
ARKANSAS
SPAVINAW
JAY
PRYOR
TENESITA
LOWREY
MOCCOYS
ARKANSAS
MUSKOGEE
RIVER
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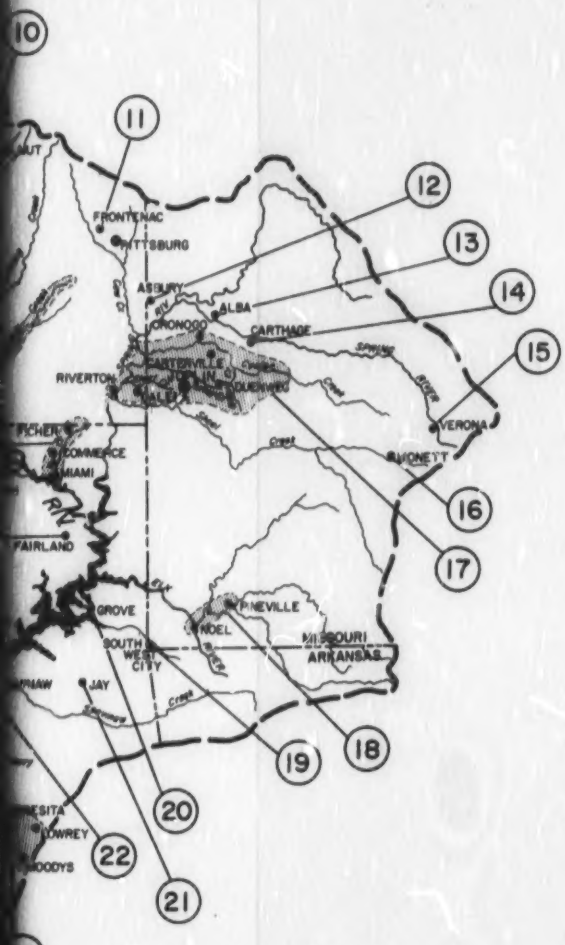
VICINITY MAP

BASIN BOUNDARY



LEGEND

(2) NEEDS

CATTLE FEEDLOTS – Area of concentration

IMMEDIATE WATER POLLUTION CONTROL NEEDS
GRAND (NEOSHO) RIVER BASIN
KANSAS, OKLAHOMA, MISSOURI AND ARKANSAS

LOCATION MAP

UNITED STATES DEPARTMENT OF THE INTERIOR
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FIGURE 1

II. Summary of Immediate Pollution Control Needs

In the Grand (Neosho) River Basin, septic conditions, oxygen depletion and high concentrations of certain constituents are indicators of pollution problems. The problems, in terms of impaired uses, are degradation of esthetics, damages to propagation of fish life, municipal and industrial water supply, and recreation uses. The immediate pollution control needs are listed in the following tabulation and grouped into categories: waste treatment, flow regulation, other pollution control practices, institutional practices and research. Location designations refer to Figure 1.

Location	Responsibility	Need	Priority
Waste Treatment			
1	City of Canton, Kansas	New primary & secondary facilities	B
2	City of Lehigh, Kansas	Primary & secondary treatment	B
	City of Hillsboro, Kansas	Expansion of secondary facilities	B
3	Fanstil Packing Co. Emporia, Kansas	Connect to city sewers	B
4	City of Dwight, Kansas	Primary & secondary treatment	B
5	City of Gridley, Kansas	Primary & secondary treatment	B
6	City of Humboldt, Kansas	Expansion of secondary facilities	B
7	City of Thayer, Kansas	Primary & secondary treatment	B

Location	Responsibility	Need	Priority
Waste Treatment (Continued)			
8	City of Oswego, Kansas	Expansion of secondary facilities	B
10	City of Walnut, Kansas	Primary & secondary treatment	B
11	City of Frontenac, Kansas	New primary & secondary facilities	B
12	City of Asbury, Missouri	Primary & secondary treatment	B
13	City of Alba, Missouri	Primary & secondary treatment	B
14	Lacarni Marble Co. Carthage Marble Co. near Carthage, Mo.	Settling ponds	B
15	City of Verona, Missouri	Primary & secondary treatment	B
16	City of Monett, Missouri	New primary & secondary facilities	B
17	City of Galena, Kansas	Primary & secondary treatment	B
	City of Riverton, Kansas	Primary & secondary treatment	B
	City of Carterville, Mo.	Primary & secondary treatment	B
	City of Duenweg, Missouri	Primary & secondary treatment	B
	City of Oronogo, Missouri	Primary & secondary treatment	B
	Solar Nitrogen Co. Atlas Chemical Co. Davidson Chemical Co. Farmers Chemical Co. near Joplin, Missouri	Additional chemical treatment	A

Location	Responsibility	Need	Priority
Waste Treatment (Continued)			
18	City of Noel, Missouri	Primary & secondary treatment	B
	City of Pineville, Mo.	Primary & secondary treatment	B
19	City of Southwest City,Mo.	New primary & secondary facilities	B
20	City of Grove, Oklahoma	Expansion of treatment facilities	B
21	City of Jay, Oklahoma	Expansion of treatment facilities	B
22	City of Spavinaw, Okla.	Primary & secondary treatment	B
23	North Cherokee Co. Sewer District	Primary & secondary treatment	B
24	State of Okla. Sequoyah State Park	Retention lagoons at four areas	B
25	Pryor Industrial Conservation Corp. Pryor, Okla.	Expansion of facilities	A
26	City of Big Cabin, Okla.	Primary & secondary treatment	B
27	City of Vinita, Okla.	Expansion of treatment facilities	B
28	City of Fairland, Okla.	New primary & secondary facilities	B
29	City of Welch, Okla.	New primary & secondary facilities	B
30	City of Commerce, Okla.	Expansion of treatment facilities	B

Location	Responsibility	Need	Priority
Waste Treatment (Continued)			
30	City of Miami, Okla.	Expansion of treatment facilities	B
	City of Picher, Okla.	New primary & secondary treatment	B
Flow Regulation			
3	Corps of Engineers	Cottonwood River - storage to provide a supplemental flow for dilution of Emporia, Kansas waste effluent	A
17	Corps of Engineers	Center Creek - storage to provide supplemental flow for quality control and low flow augmentation for industrial discharges and natural zinc pollution	A
17	Corps of Engineers	Turkey Creek - storage to provide supplemental flow for quality control and low flow augmentation below Joplin, Missouri	A
Other Pollution Control Practices			
Basinwide	Feedlot Operators	Interception of feedlot runoff	A
Basinwide	States of Kansas and Oklahoma, and Oil Interests	Plugging of abandoned oil wells	A
9	State of Kansas	Control of acid mine drainage to Cherry Creek	A
30	Mine Operators Lead and Zinc Mines, Tar Creek	Treatment or disposal of mine waters	A

Location	Responsibility	Need	Priority
Institutional Practices			
Basinwide	States of Kansas and Oklahoma	Adopt feedlot regulations	A
Basinwide	States of Kansas and Oklahoma	Increase budget and staffing of agencies involved in oil field pollution	A
Basinwide	States in Basin	Expand water quality control surveillance program (including treatment plant operation & maintenance)	B
Basinwide	State of Oklahoma	Prepare and maintain a complete industrial waste discharge inventory	B
Basinwide	States in Basin	Adopt water quality standards	B
Basinwide	States in Basin	Consider legislation to provide appropriations for state participation in grants for construction of sewage works	B
Research			
Basinwide	States of Kansas and Oklahoma, FWPCA, and Universities in Area	Means to control and/or treat feedlot runoff	A
Basinwide	States of Kansas, Missouri and Oklahoma, FWPCA, and Universities in Area	Means to control and/or treat mine drainage	B

III. Immediate Control Needs

Various measures are needed to control existing and potential water pollution of the Grand (Neosho) River and its tributaries. Measures to abate septic conditions, increase oxygen content and reduce the concentrations of toxic materials and nitrates are needed for the protection of water uses within the basin. These uses include municipal and industrial water supply, propagation of fish and wildlife, and recreation.

The actions recommended here though not all encompassing are, however, prerequisite to good water quality planning and should be included in local, state, and Federal programming for water pollution control. Background for these immediate needs is summarized in Chapter VI.

Waste Treatment

Enlarged or additional industrial waste treatment facilities are needed immediately at 5 locations in the basin. The Pryor Industrial Conservation Corporation, treating the wastes of a rapidly growing industrial complex, needs an expansion of existing facilities to reduce the pollutants reaching Pryor Creek.

The Solar Nitrogen Company, Atlas Chemical Company, Davidson Chemical Company, and Farmers Chemical Company, all near Joplin, Missouri, require additional chemical treatment of waste effluents for removal of fluorides, ammonia, and zinc.

New or expanded treatment facilities are needed by at least three other industries, 27 communities and sewer districts, and one state park (as listed in the summary table). The list of needs is not considered all inclusive and does not reflect projected needs due to future obsolescence or to expanded or changed water uses.

Flow Regulation

Reservoir storage in the Cottonwood River watershed is currently needed to supplement low flows in the stream and increase its assimilative capacity and dilution of treated waste effluents from the City of Emporia, Kansas. Marion Reservoir, a multi-purpose Corps of Engineers reservoir on Cedar Creek has storage allocated for water quality control releases to meet future requirements.

Maintenance of higher low flows is needed on Center Creek above Grove Creek to provide dilution flow for treated municipal and industrial waste effluents and zinc mine drainage from abandoned strip and shaft zinc mines. An average annual supplemental flow of approximately 7 cfs is currently needed.

An average annual supplemental flow of approximately 3 cfs is needed immediately on Turkey Creek below Joplin, Missouri, to increase its assimilative capacity and dilution of the secondary treated effluent of Joplin.

Other Pollution Control Practices

Interception of storm runoff from many large cattle feedlots in the basin by the construction of lagoons or holding ponds for treatment and/or land disposal is immediately needed as a first step in preventing the gross pollution of many surface streams that is presently occurring.

The plugging of abandoned oil wells to prevent pollution of surface or groundwater supplies is needed where reinjection of oil field brines for disposal and water flooding operations causes or may cause brine to reappear in improperly plugged wells.

The sealing off of all abandoned coal mine shafts and other openings in the Cherry Creek basin is required to prevent highly acid water from flowing or seeping to Cherry Creek.

Waters pumped from reactivated lead and zinc mines in Tar Creek area need to be recharged to wells or abandoned mines or treated for removal of lead and zinc before being discharged to surface streams.

Institutional Practices

A permit system as currently proposed by the Kansas Department of Health is drastically needed in Kansas and Oklahoma to prevent and abate surface water pollution from feedlot runoff.

The States of Kansas and Oklahoma need an increase in budget appropriations for agencies concerned with oil field pollution to

increase their staffs and to make funds available for plugging of abandoned problem oil wells where a responsible party cannot be ascertained.

To strengthen the States' position on prevention, control and abatement of stream pollution, water quality standards are needed on interstate and intrastate streams. Increased surveillance and operation inspection of sewage and industrial waste treatment plants are needed to locate and identify existing or potential serious pollution problems.

For more rigid control over industrial pollution and aid in solving complex stream quality problems, a complete inventory is needed in Oklahoma of industrial waste discharges, listing quantity and quality of effluent.

Research

Further research is needed to solve the problem of feedlot runoff pollution. In addition to means to control and/or treat runoff, which should solve the immediate problem, pollution to ground water supplies and nutrient buildup in streams and reservoirs are two of the many other potential problems.

Research is needed to determine the extent of pollution from abandoned lead, zinc, and coal mines in the Joplin area and means to control the flow or seepage of mine water to surface streams.

IV. Costs

The estimated cost of pollution control measures listed in the summary table is shown in the following tabulation:

Item		Estimated Cost
Municipalities:		
New treatment facilities		$2,270,000
Improvement or expansion of facilities		810,000
	Sub Total	$3,080,000
Industries		
New or additional treatment facilities		$ 270,000
State Parks		
New treatment facilities		$ 10,000
Flood Regulation		
Storage in Corps of Engineers Reservoirs to:		
Supplement	Cottonwood River Flow	$1,000,000
Supplement	Center Creek Flow	600,000
Supplement	Turkey Creek Flow	400,000
	Sub Total	$2,000,000
Agricultural Areas		
Feedlot Runoff Control		$ 500,000
	TOTAL	$5,860,000

Of the total cost, approximately $2,750,000, exclusive of research and institutional costs, would be needed for control measures listed under priority "A" in the summary table.

V. Recent Progress in Pollution Control

Federal

Through a continuing construction grants program, Federal grants for treatment facilities and appurtenant works have been made to 33 towns and cities in the basin since 1958.

Four U. S. Corps of Engineers reservoirs in the Upper Grand (Neosho) River Basin have storage allocated for water quality control. John Redmond and Council Grove were completed in 1965. Marion Reservoir is now under construction, and the fourth, Cedar Point Reservoir on Cedar Creek, is authorized.

State

The States of Arkansas, Kansas, Missouri, and Oklahoma have made significant progress in recent years to control water pollution in the basin through surveillance, construction of treatment facilities, training programs, stream monitoring networks, and inspection of treatment plant operation. Pollution by oil field brines in Kansas and Oklahoma has been greatly reduced through state enforcement. The Corporation Commission of Oklahoma recently issued an order that all earthen pits used for the handling, storage, or disposal of deleterious substances produced in connection with the operation of oil wells or refineries shall be sealed with an impervious material and that any flow from these pits be prevented. The Kansas State Department of Health has proposed more stringent regulations over feedlot operations to prevent water pollution from feedlot runoff. The Missouri Water Pollution Control Board recently completed a thorough stream and waste survey of the Spring River Basin in Missouri and is advising the municipalities and industries in this area on pollution control needs.

In addition, all states in the basin are preparing water quality standards for all interstate streams.

Research

The University of Kansas and Kansas State University have current research projects on the control and treatment of feedlot wastes. These projects are sponsored by grants from Federal and state government, and agricultural interests.

VI. Background

Pertinent Basin Characteristics

The Grand (Neosho) River Basin encompasses an area of about 12,520 square miles in four states; 6,260 square miles in Kansas; 2,940 square miles in Oklahoma; 2,940 square miles in Missouri; and 380 square miles in Arkansas. The river rises in east-central Kansas and flows southeast and south about 480 miles to join the Arkansas River near Muskogee, Oklahoma.

Major tributaries to the Grand (Neosho) River are the Cottonwood River, Spring River and Elk River. Above the confluence of the Spring River, the Grand (Neosho) River is known as the Neosho River.

Streamflows in the basin are highly erratic, low and zero flows occurring frequently in the Kansas portion. The average annual streamflow of the Grand (Neosho) River near Parsons, Kansas, is 2,414 cfs, but daily extremes have ranged from zero to 410,000 cfs. Base flow in the Missouri and Arkansas portion of the basin is higher because of flow from numerous springs in the western edge of the Ozark Plateau.

A 130 mile reach of the Grand (Neosho) River beginning near the Spring River confluence and extending downstream almost to the Arkansas River is now a series of lakes formed by Pensacola, Markham Ferry, and Fort Gibson Reservoirs. Fort Gibson Dam and Reservoir is a multi-purpose Corps of Engineers project used for flood control, power generation, water supply, and recreation. Pensacola and Markham Ferry reservoirs are Grand River Dam Authority projects used for flood control, power generation, and recreation.

Three other major reservoirs in the basin are John Redmond, Council Grove, and Marion (under construction). These three reservoirs are Corps of Engineers multi-purpose projects used for flood control, water supply, water quality control, and recreation.

The primary economic activities in the basin are farming and raising of livestock, petroleum production, and chemical manufacturing. Lead and zinc mining, in previous years a major industry in the basin, is currently at a low level of activity.

The major towns in the basin are Joplin, Missouri (38,958), Pittsburg, Kansas (18,678), Emporia, Kansas (18,190), Parsons, Kansas (13,929), and Miami, Oklahoma (12,869).

The water resources of the basin are an important asset and are used primarily for municipal and industrial water supplies, fish and wildlife propagation, recreation, and power generation.

Water Quality

The chemical quality of ground and surface waters in the Grand (Neosho) River Basin is good, although in certain areas treatment to remove excessive hardness is required. The following tabulation, in general, reflects this good quality.

Location		Weighted Average (ppm) Sulfates	Chlorides	Dissolved Solids	Hardness as $CaCO_3$
Grand (Neosho) River near Parsons, Kansas	10-63 to 9-64	62	23	245	166
Grand (Neosho) River below Fort Gibson Reservoir, Oklahoma	10-62 to 9-63	40	11	197	137

Present Water Quality Problems

Pollution of the mainstem and most tributaries of the Grand (Neosho) River Basin at the present time is not a severe problem because of the comparatively small population and few industries. Most heavy water using industries, principally the food and kindred products industry, are located within the corporate limits of cities within the basin and discharge their wastes through the municipal systems. Some pollution problems, however, exist as a result of extremely low streamflows during the summer months, inadequately treated municipal and industrial waste, and cattle feedlot runoff.

Feedlot Runoff in Kansas

The major water pollution problem in the basin is the organic pollution and subsequent oxygen depletion caused by runoff from cattle feedlots. The feeding of very large numbers of animals in confined areas is a relatively recent and rapidly expanding development in agriculture. The largest concentration of cattle feedlots in the State of Kansas is at the headwaters of the Grand (Neosho) River.

There are at least ten feedlots in the Emporia area with capacities over 5,000, and combined feeding capacity of over 100,000 cattle. In the entire Grand (Neosho) River Basin, there are 58 feedlots of over 300 capacity. Total feedlot capacity exceeds 200,000. Eighty-five percent of this capacity is located in Kansas, the majority of which is in the Cottonwood River drainage basin. The wastes from these cattle would be equivalent to the wastes from several million people. During 1966 alone, there were eight major fish kills reported in the Cottonwood River and its tributaries. The two largest involved 300,000 fish each and were total kills. The cause indicated in each kill was reported as feedlot runoff. Of equal importance to the fish kills caused by oxygen depletion is the potential health hazard to humans from bacteria in the animal wastes and the buildup of nitrates in ground water and John Redmond Reservoir.

Center Creek near Joplin, Missouri

Center Creek receives the wastes from four chemical plants (fertilizer and explosive) near Joplin, Missouri, which are not presently adequately treating their waste, as indicated by several reported fish kills in Center Creek in 1965 and 1966 attributed to chemical pollution. Water samples taken above and below the Grove Creek confluence to Center Creek show great increases in the concentrations of ammonia, nitrates, nitrites, orthophosphates, sulfates, fluorides, and zinc. Most of the zinc pollution is from natural runoff and seepage from abandoned zinc mines and water pumped from zinc mines and used for cooling by the industries.

The industries involved have indicated a willingness to correct the problem and are awaiting the advice of the Missouri Water Pollution Board as to what treatment would be necessary to meet stream standards.

Turkey Creek near Joplin, Missouri

The flow of Turkey Creek is frequently inadequate to assimilate the secondary treated wastes of Joplin, Missouri, which occasionally causes a depletion of oxygen and septic conditions.

Pryor Creek near Pryor, Oklahoma

Waste discharges from industries in the Pryor Industrial District have frequently accumulated in the river bed during periods of low flow to be flushed out during high flow periods. High nitrate concentrations and low dissolved oxygen have caused fish kills in the creek and Fort Gibson Reservoir and some livestock have died from drinking water in the creek.

Tar Creek near Miami, Oklahoma

The concentration of lead in Tar Creek has been reported as high as 5.0 ppm, which would eliminate all possible uses of this creek. The cause of this pollution is thought to be natural drainage from abandoned lead mines and the pumping of mine water from active mines.

Cherry Creek, Kansas

Cherry Creek is badly polluted by sulfuric acid and is unfit for domestic use as well as for fish and other aquatic life. This condition is caused by drainage from abandoned coal mines.

Oil Fields

Many oil field areas in the basin, particularly in Oklahoma, have minor local problems caused by oil field brines reaching the surface from improperly plugged abandoned wells during reinjection or water flooding operations in an old field.

Other Areas

Throughout the Grand (Neosho) basin there are many small problems of water pollution in streams receiving waste discharges from communities and industries having inadequate treatment facilities. These are tabulated in the summary table and are shown on Figure 1.

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